

AD-A145 495

DESIGN CONSTRUCTION DEMONSTRATION AND DELIVERY OF AN
AUTOMATED NARROW GAP WELDING SYSTEM(U) CRC AUTOMATIC
WELDING CO HOUSTON TX 29 JUN 82 CRC-NAV-A/W-4

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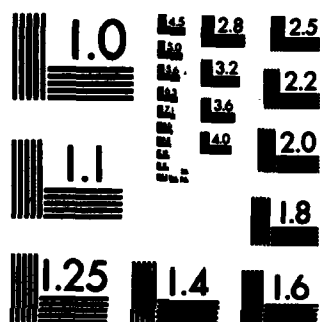
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AD-A145 495

CRC REPORT NO. NAV A/W 4

PHASE 2 REPORT

ON

DESIGN, CONSTRUCTION, DEMONSTRATION AND
DELIVERY OF AN AUTOMATED NARROW GAP
WELDING SYSTEM

CONTRACT NO. N00600-81-C-E923

TO

DAVID TAYLOR NAVAL RESEARCH AND DEVELOPMENT CENTER
DEPARTMENT OF THE NAVY

FROM

CRC AUTOMATIC WELDING
JUNE 29, 1982

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CRC AUTOMATIC WELDING

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MILT RANDALL

Vice President - Research & New Product Development

June 29, 1982

Receiving Officer
David W. Taylor Naval Ship Research
Annapolis Laboratory
Annapolis, Md. 21402
(Code: 2821)

Contract Number - N-00600-81-C-E923

Gentlemen:

Enclosed are two copies of the Phase 2 Report CRC Report No. NAV A/W 4, on the subject contract. This report covers the period from December 3, 1981 through June 29, 1982 and completes Phase 2 of the subject contract. On approval of this Phase, CRC Automatic Welding will initiate Phase 3, Equipment Construction, immediately.

If you have any questions concerning this report, please contact me.

Very truly yours,

Milton D. Randall
Milton D. Randall

MDR/sd

Enclosures (2) Phase 2 Reports

PROJECT NO.	
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CRC REPORT NO. NAV A/W 4

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FROM

CRC AUTOMATIC WELDING
JUNE 29, 1982

INTRODUCTION

The overall objective of this program is to design, construct, demonstrate, and deliver an automated, Narrow Gap welding system capable of welding high strength steel plates under shipyard production conditions in the construction of aircraft carrier decks. The unique feature of the automated Narrow Gap welding process, is the narrow ($3/8$ - inch), square-butt joint design. This narrow joint greatly reduces the volume of weld metal required for thick (2-to 4-inch) plates compared to the conventional, beveled joint design in current practice and represents the potential of greatly reducing fabrication time and costs. The weld metal is deposited with a modified, gas-metal-arc (GMA) welding process resulting in very high joint finishing rates, excellent weld mechanical properties, and less distortion from welding.

The program is being conducted in five phases:

- (1) Definition of Requirements
- (2) Design of Welder Package
- (3) Equipment Construction
- (4) Qualification of Process and Equipment
- (5) Shipyard Demonstration

Phase I was completed slightly ahead of schedule and the Phase I Report, CRC Report No. Nav A/W 1 was submitted November 5, 1981. Phase 1 was devoted to a thorough review of the requirements that must be met by a shipyard production Automated Narrow Gap Welding System (ANGWS)

PHASE 2 - DESIGN OF WELDER PACKAGE

The objective of Phase 2 was the detailed design of the welder package (ANGWS). The design philosophy that was used is as follows:

1. Keep the design and manufacture as simple as possible consistent with operational requirements.
2. Design and build in high equipment reliability, portability and ruggedness.
3. Make the equipment simple to operate with a high degree of reproducibility in a typical shipyard environment.
4. Make the equipment simple to maintain utilizing available shipyard skills.

Design Approach

Close liaison with David Taylor Naval Research and Development Center (DTNSRDC), Navsea PNS 392, Navsea 05E2, and Newport News, Shipbuilding (NNS) has been maintained throughout the Phase 2 design effort. In

particular, the input from Newport News Shipbuilding was of prime importance to insure that the welder package (ANGWS) was as simple as possible to setup, to operate, and to maintain in a shipyard environment.

The ANGWS is a totally automatic, closed-loop feedback system. There is no man-machine interface during operation of the system. The design approach that was followed was to modularize the components of the welding system to simplify design, construction, and field maintenance. The major components of the system are: (1) wire drive/wire straightener, (2) carriage/carriage drive, (3) oscillator/torch assembly with automatic centering and automatic width control and automatic contact tube-to-work control, (4) gas-shielding assembly, (5) contact-tube assembly, (6) welding power supply, and (7) microprocessor and electronic circuitry.

The physical and environmental constraints on the system design were defined during the Phase 1 effort and outlined in the Phase 1 report, "Definition of Requirements", dated November 5, 1981, CRC Report No. NAV A/W 1. The problems encountered during the design phase and the solutions to those problems were discussed in detail in the First Progress Report, CRC Report No. NAV A/W 2, dated December 5, 1981, and the Second Progress Report, CRC Report No. NAV A/W 3, dated June 1, 1982.

Design Drawings

The component assembly drawings, the individual part drawings of components, the assembly and schematic drawings for the printed circuit boards and the computer enclosure are enclosed. Some of the drawings are stamped "Preliminary".

It is the policy of the CRC Engineering Department to mark all drawings preliminary until the prototype system has been fabricated, tested, and accepted.

The first letter designates the size of the drawing. The middle letters are the initials of the design engineer.

A list of the drawings is attached. There are 184 drawings. Submission and acceptance of these drawings will conclude Phase 2. On approval of DTNSRDC, Phase 3, Equipment Construction, will be initiated.

LIST OF DRAWINGS

<u>Drawing Number</u>	<u>Title</u>	<u>Number of Sheets</u>
D-001	Welder End View	1
C-002	Plan View Bug Drive	1
C-003	Oscillator Assembly	1
D-004	Torch End View	1
D-005	Shield Assembly	1
B-171	Boot Retainer	1
B-1007	Cover, Torch Carriage	1
D-007	Rail Weldment	1
B-010	Angle Adjust Drive	1
C-011	Bug Drive Trailing Wheel	2
B-012	Spindle Oscillating Head	2
A-013	Guide Wheel Application	1
C-014	Bug Drive Clutch Wheel	2
A-015	Boot Assembly	1
B-016	Yoke Guide System	1
B-017	Oscillator Head and Vertical Travel	2
A-018		1
A-019	Head Angle Proximity Switch	1
A-021	Shaft Coupling	1
B-022	Bearing Mtg. Plate	1
B-023	Bearing Mtg. Plate	1
B-025	Bearing Mtg. Block	1
B-026	Slide Mtg. Block	1
B-027	Motor Mtg. Block	1
B-028	Motor Mtg. Block	1
C-029	Mtg. Plate Vertical Drive	1
A-030	Shaft, Worm-Vertical Drive	1
A-031	Shaft, Worm Gear-Vertical Drive	1
C-032	Yoke-Oscillator Drive	1
A-053	Shaft, Yoke Guide	1
A-034	Oscillator Drive Screw	1
A-035	Bracket, Proximity Switch	1
A-036	Bracket, Proximity Switch	1
B-037	Mtg. Plate, Motor Oscillator	1
A-038	Bracket, Magnet-Oscillator Drive	1
A-039	Bracket, Magnet Head Angle	1
A-040	Mtg. Block-Roller Head Angle	1
A-042	Roller Head Angle	1
B-043	Mtg. Plate-Motor-Head Angle	1
B-044	Mtg. Plate-Bearing Head Angle	1
B-045	Mtg. Plate-Head Angle Drive	1
A-046	Shaft, Worm-Head Angle Drive	1
B-047	Mtg. Block, Bearing Torch Head	1
A-048	Spline Bushing	1
A-049	Spline Shaft	1
A-050	Spline Bushing	1
A-051	Washer	1

List of Drawings -- Page 2 --

<u>Drawing Number</u>	<u>Title</u>	<u>Number Of Sheets</u>
A-052	Washer	1
A-053	Worm Gear-Mod.	1
A-054	Spline Shaft Vertical Drive	1
A-055	Felt Wiper	1
A-056	Bronze Washer	1
B-057	Flange, Oscillator Head	1
C-058	Mtg. Block Oscillator Head	1
B-059	Mtg. Block, Head Angle	1
C-060	Shaft, Oscillator	1
B-061	Shaft, Drive-Oscillator	1
A-062	Ring, Bearing Mtg.	1
A-063	Nut, Oscillator Shaft	1
D-100	Oscillator Housing Casting	3
B-101	Mtg. Block, Spring Adjust	1
B-102	Mtg. Block, Spring Pack Rear	1
B-103	Mtg. Block, Spring Pack Front	1
B-104	Mtg. Block	1
B-105	Mtg. Block	1
A-106	Shaft Pivot Mtg.	1
B-107	Shaft, Free Wheel	1
B-108	Shaft, Free Wheel Mtg.	1
A-109	Latch, Free Wheel Mtg.	1
A-110	Bracket, Free Wheel Latch Mtg.	1
A-111	Handle, Free Wheel	1
A-112	Bracket, Guide Wheel Mtg.	1
A-113	Bracket, Guide Wheel Mtg.	1
B-114	Shaft, Guide Wheel Right	1
B-115	Shaft, Guide Wheel Left	1
A-116	Guide Wheel	1
B-117	Core, Clutch Wheel	1
B-118	Wheel Assy.	1
A-119	Shield	1
A-120	Shaft, Harmonic Drive Inspect	1
C-121	Shaft, Harmonic Drive Output	1
C-123	Mtg. Plate, Harmonic Drive Top	1
D-124	Mtg. Plate Weldment	1
C-125	Mtg. Plate Harmonic Drive Bottom	1
A-126	Wear Plate, Harmonic Drive	1
A-127	Spur Gear Mod.	1
A-128	Spacer Harmonic Drive	1
A-129	Spacer	1
C-131	Shaft, Drive	1
B-132	Spur Gear, Mod.-Drive	1
B-133	Core, Drive Wheel	1
B-134	Drive Wheel Assembly	1

List of Drawings -- Page 3 --

<u>Drawing Number</u>	<u>Title</u>	<u>Number of Sheets</u>
D-150	Drive Housing Casting	3
C-161	Mtg. Bracket, Spool	1
C-162	Cover, Wire Spool	1
C-165	Rear Handle Bracket, Right	1
C-166	Rear Handle Bracket, Left	1
B-167	Handle	1
B-168	Front Handle Bracket, Right	1
B-169	Front Handle Bracket, Left	1
C-170	Core Roller Mount	1
D-250	Torch Housing Casting	1
D-1008	Torch Carriage	1
B-1001	Torch	1
A-1002	Cover, Torch	1
B-1003	Torch Mtg. Block	1
A-1004	Welding Tip	1
A-1005	Copper Tube	1
C-1006	Torch Assembly	1
A-1009	Tube Guide	1
A-064	Washer Roller	1
A-1010	Bowden Tube Mount	1
D-10066	Downmount Board	1
D-10067	Downmount Board	1
D-10069	Bug Interface	1
D-10070	T-W, 4-A P.C. Board	1
D-10071	T-W, 4-B P.C. Assy.	1
D-10072	Artwork, Silkscreen, Stepper Motor Driver	1
D-10073	Stepper Motor Driver	1
D-10075		1
D-10076	Dual Motor Control	1
D-10077	Phase Lock Loop Motor Control	1
D-10078	Artwork, Silkscreen Oscillator P.C.B.	1
D-10079	Buss Mounted Oscillator P.C. Assy.	1
D-10080	Signal Conditioner P.C.B.	1
D-10081	Signal Conditioner P.C. Assy.	1
D-10082	Frequency Generator, P.C.B.	1
D-10083	Frequency Generator, P.C. Assy.	1
D-10084	Decode Latch P.C.B.	1
D-10085	Decode Latch P.C. Assy.	1
D-10091	Card Cage Assy.	1
D-10092	Side Plate, Card Cage Left	1
D-10093	Side Plate, Card Cage Right	1
C-10094	Plate, Card Cage End	1
B-10095	Separator Plate, Card Cage	1
D-10096	Computer Box Assembly	2
D-10097	Chassis, Computer Box	3
D-10100	Contact Box Assembly	1

List of Drawings -- Page 4 --

<u>Drawing Number</u>	<u>Title</u>	<u>Number of Sheets</u>
B-10101	Schematic, Contactor Box	1
D-10102	Box, Contactor	1
D-10103	Heat Sink	1
D-10106	Wire Drive Assembly	3
A-10150	Wire Straightener Roller	1
D-10161	Heat Sink Assy.	1
C-10164	Heat Sink	1
D-10166	Wire Drive Housing	1
D-10167	Gear Box	1
D-10168	Roller Block Carrier	1
D-10169	Pinch Roller Block	1
D-10170	Wire Transport	1
B-10171	Mounting Plate	1
A-10172	Power Shaft	1
A-10173	Drive Shaft	1
A-10174	Wire Roller Shaft	1
A-10175	Wire Drive Shaft Key	1
A-10176	Power Shaft Spacer	1
A-10177	Nameplate On-Off	1
A-10178	Wire Drive Wheel	1
A-10179	Wire Drive Wheel Bushing	1
A-10180	Felt Washer	1
A-10181	Shaft End Washer	1
A-10182	Drive Shaft Lower Gear	1
A-10183	Power Shaft Gear	1
A-10184	Drive Shaft Upper Gear	1
A-10185	Wire Roller Shaft Gear	1
A-10186	Bending Mandrel	1
A-10260	Wire Drive Housing Casting	1
B-10263	Hinge, Computer Box	1
B-10264	Spacer, Computer Box	1
D-10271	Schematic, Welding Bug	1
A-10283	Wire Drive Wiring Diagram	1

END

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